Operating and Maintenance Handbook

MARCONI INSTRUMENTS LIMITED, ENGLAND

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NOISE GENERATOR

TYPE [illegible] SERIES

OPERATING AND MAINTENANCE

HANDBOOK

for

NOISE GENERATOR

TYPES TF 1106, /1, /2, and /3

AMENDMENTS, if any,
are included at the end
of this handbook.

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Front Panel ..... MP 1106 -1

Top and Underside of Chassis ..... MP 1106 -2

SPARES ORDERING SCHEDULE ..... SOS/1106 (Series)

FUNCTIONAL DIAGRAM ..... TLC 24870

COMPLETE CIRCUIT DIAGRAM ..... TLC 26110

SCHEDULE OF PARTS SUPPLIED

1. One Noise Generator Type TF 1106, /1, /2, or /3, as ordered, complete with valves, attached mains lead, etc., as under :-

Valves:	One:	Type A2087 (CV2171), Noise Diode.
	One:	Type 6X5GT (CV574), Full-Wave Rectifier.
	One:	Type QS150/45 (CV395), Voltage Stabilizer.
Lamp:	One:	6.5-volt, 0.3-amp, M.E.S., Pilot Lamp.

2. One Coaxial Free Plug; Films and Equipments Type JP1-250-CCT.

3. One Operating and Maintenance Handbook No. OM 1106 (Series).

The following items are optional accessories, supplied only if specially ordered :-

Output Lead, 70-ohm; TM 5726/6 for TF 1106 or /1; 60 inches long; F and E plugs both ends.

Output Lead, 52-ohm; TM 4726/11 for TF 1106/2 or /3; 36-inches long; F and E plugs both ends.

1 DESCRIPTION

1.1 GENERAL

The Marconi TF 1106 series of Noise Generators provide standard noise outputs for the determination of the noise factor of a.m. and f.m. receivers operating at any frequency in the range 1 to 200 Mc/s.

The series of four instruments offers a choice of either 52- or 71-ohm output impedance and a choice of mains input circuit to suit either 100- to 125-volt or 200- to 250-volt a.c. supplies.

The four versions of the Noise Generator that are available are as detailed below :-

Instrument Type Number	Supply Mains	Output Termination Resistance
TF 1106	200 to 250 volts, 40 to 100 c/s	71 Ω
TF 1106/1	100 to 125 volts, 40 to 100 c/s	71 Ω
TF 1106/2	200 to 250 volts, 40 to 100 c/s	52 Ω
TF 1106/3	100 to 125 volts, 40 to 100 c/s	52 Ω

There are four noise factor ranges - 0 to 5, 0 to 10, 0 to 15, and 0 to 30; on any one range, output is determined by the setting of a continuously-variable control.

1.2 DESIGN DETAILS

The definition of noise factor is given in the British Standards Institution Specification B.S. 2065: 1954, paragraph 202, and can be stated briefly as the ratio of (a) the equivalent noise input to the receiver to (b) the thermal noise for the bandwidth covered by the receiver; it can be expressed as a simple factor F, or in decibels as $10 \log_{10} F$dB. In the perfect receiver (a) and (b) would be equal and F would have a value of unity; in practice, (a) is always greater than (b) to the extent depending on both the magnitude of the noise generated in the receiver and the points in the receiver circuit at which it is developed. Thus, the noise factor may be regarded as a measure of the effectiveness of design of the receiver - particularly the input stage or stages.

1.2 (continued)

The measurement of noise factor is carried out by first checking the output level of the receiver due to internal noise with the noise generator connected but with no signal applied, and then injecting a noise signal of sufficient amplitude to double the noise power output of the receiver.

With the noise energy generated by a temperature-limited noise diode, the noise factor, F, is given by the expression $F = 20I_a R_o$ when measured by the method described in the previous paragraph. I_a is the noise-diode anode current in amperes and R_o the noise generator output termination resistance in ohms.

Hence, it can be seen that, for a fixed value of R_o, the noise factor is directly proportional to the noise-diode anode current and that this current can be monitored by an ammeter calibrated directly in terms of noise factor. It is this principle that is used in the TF 1106 series of instruments.

In the Marconi Noise Generators, the filament current is variable to control the emission of the valve, and is supplied via a separate step-down transformer fed from a fixed tapping point on the mains transformer. The anode current, monitored by a moving-coil meter, is adjusted by means of a variable resistor in the primary circuit of the filament transformer in conjunction with a suitable series resistor in the secondary circuit. The series resistor appropriate to the noise-factor range in use is selected by a switch which also selects the required meter shunt. This switch has an 'off' position enabling the noise signal to be switched off while still maintaining the supply to the a.c. power pack and leaving the output-termination resistor connected to the receiver under test.

The diode anode voltage is supplied from the mains transformer via a full-wave rectifier, a resistance-capacitance smoothing circuit, and a voltage stabilizer tube.

2 OPERATION

2.1 INSTALLATION

Unless otherwise specified, the Noise Generator is normally despatched with its valves in position, and with its mains input circuit adjusted for immediate use with either 110-volt or 240-volt 40- to 100-c/s supplies depending on the type of instrument.

Section 2.1.1 deals with the adjustment of the mains-input circuit of the 100-volt models (TF 1106/1 and TF 1106/3) and Section 2.1.2 deals with the 200-volt models.

2.1.1 TF 1106/1 and TF 1106/3: adjustment of mains-input circuit

The TF 1106/1 and TF 1106/3 can be adjusted to operate from any supply within the range 100 to 125 volts. To adjust the tappings, remove the case as described in Section 4.4 and adjust the two fly-leads connecting the fuses to the auto-transformer T3 to suit the particular supply in use. For example, if it is required to operate the instrument from 115-volt supplies, the fly-leads should be connected to the '110 V and '+5 V' taps. None of the other leads associated with the mains-input circuit will required adjustment.

2.1.2 TF 1106 and TF 1106/2: adjustment of mains-input circuit

The TF 1106 and TF 1106/2 can be adjusted to operate from any supply within the range 200 to 250 volts. To adjust the tappings, first remove the case as described in Section 4.4. Do not alter the lead from the fuse to the 'C' tapping, or the lead from the '250 V' tapping to the filament transformer T1, but adjust the remaining lead to suit the particular supply in use. In the case of 'borderline' voltages (e.g. 225 V) always adjust the tapping to the nearest voltage above that of the supply.

2.2 OPERATING PROCEDURE

With the OUTPUT LEVEL control fully counter-clockwise and the RANGE switch at OFF, set the SUPPLY switch to ON. Note that the pilot lamp glows, allow sufficient time for the internal circuits of the Noise Generator to attain thermal equilibrium, and then proceed as follows :-

2.2 (continued)

(1) Connect the Noise Generator OUTPUT socket to the receiver under test by means of a coaxial cable (suitable cables can be supplied, if specially ordered - see page iv of this handbook). Determine the noise power output of the receiver with the RANGE switch set to OFF, that is, with the Noise Generator output impedance loading the receiver input with no injected noise signal. (For notes on suitable noise power output indicators, see Section 2.3.)

(2) Alter the RANGE switch setting from OFF to 0-5 and then advance the OUTPUT LEVEL control until the noise output of the receiver is doubled, advancing the RANGE switch setting as necessary. When the power output of the receiver is thus doubled, the noise factor may be read directly from the appropriate scale of the meter.

Because of maximum diode-current limitations the OUTPUT LEVEL control should not be adjusted to give a meter reading of greater than 28 in the case of 71-ohm models, or 20 in the case of 52-ohm models.

Particular care should be taken, when switching from one range to another, that the OUTPUT LEVEL control is turned fully counter-clockwise to prevent possible overloading and damage to the meter.

Care must be taken, when checking the noise factor of high-gain receivers, that errors are not introduced due to the receiver limiting when the output is doubled by means of the injected noise signal.

2.3 NOTES ON NOISE OUTPUT INDICATORS

It is important that the output to the receiver final detector should be determined by means of an indicator of linear power response, or that the response law be known. For example, a thermocouple or bolometer bridge may be used for direct power measurements; alternatively, an r.f. valve voltmeter may be employed to determine the relative noise signal voltage levels (and hence the relative power levels) developed in the anode load of the final i.f. stage.

2.3 (continued)

If it is impracticable to carry out the measurements prior to the final detector, the latter itself may be used as part of the indicating system in conjunction with d. c. meter showing the rectified current. Here again unless the detector law is known, noise factor measurements cannot be of established accuracy: if doubt exists, it may be advisable to determine the noise factor by means of the method outlined below.

(1) First measure the receiver detector current, I_1, with the Noise Generator connected but with the RANGE switch set to the OFF position.

(2) Advance the RANGE and OUTPUT LEVEL settings to indicate a convenient arbitrary NOISE FACTOR reading S_1, and measure the receiver detector current, this current being designated I_2.

(3) Without altering the settings of the Noise Generator controls, reduce the receiver gain to give a detector current of I_1.

(4) Advance the RANGE and OUTPUT LEVEL settings to restore the current reading I_2. Let the NOISE FACTOR reading thus obtained be S_2.

The noise factor is then equal to

$$\frac{S_1^2}{S_2 - 2S_1}$$

2.4 NOISE GENERATOR SOURCE RESISTANCE VARIATION

If it is required to check a receiver whose input impedance differs from the nominal output resistance of the noise generator, or , to vary the effective source resistance in order to find the impedance ratio required to produce minimum noise factor, the following method for altering the effective source resistance may be employed.

2.4 (continued)

(1) To increase the effective source resistance

A resistance, R_1, may be connected in series - externally - with the source resistance, R_o, of the noise generator, so that $R_o + R_1$ is equal to the required resistance. The noise factor then becomes :-

$$F_i \times \frac{R_o}{R_o + R_1}$$

where F_i = noise factor as read on the NOISE FACTOR meter.

NOTE : The added series resistance should be placed as near to the receiver terminals as possible in order to avoid spurious effects due to mismatching the connecting cable.

(2) To decrease the effective source resistance

A resistance, R_2, may be connected in parallel - externally - with the source resistance, R_o, so that $R_o R_2 / R_o + R_2$ is equal to the required resistance. The noise factor then becomes :-

$$F_i \times \frac{R_2}{R_o + R_2}$$

where F_i = noise factor as read on the NOISE FACTOR meter.

NOTE : The added shunt resistance should be placed as near to the receiver terminals as possible in order to avoid spurious effects due to mismatching the connecting cable.

3

OPERATIONAL SUMMARY

When the user is familiar with the principles and techniques of operation detailed in the preceding sections of this handbook, the following abridged operating instructions may be found convenient.

ABRIDGED OPERATING INSTRUCTIONS

Noise Factor Measurement Range	0 to 28 (71-ohm models). 0 to 20 (52-ohm models).
Frequency Range	1 to 200 Mc/s.
Power Supply	100 to 125 volts (TF 1106/1 and /3). 200 to 250 volts (TF 1106 and /2).

Check correctness of mains transformer setting before use

With the OUTPUT LEVEL and RANGE controls fully counter-clockwise, connect the Noise Generator to the receiver. Determine the noise power output of the receiver. Advance the OUTPUT LEVEL and RANGE control settings until the noise output of the receiver is doubled. Read the noise factor direct on the NOISE FACTOR meter.

4 MAINTENANCE

4.1 GENERAL

The following items (for details see APPENDICES, page iii) are included in this handbook to assist in the maintenance of the Noise Generator Types TF 1106, /1, /2, and /3 :-

Functional Diagram
Complete Circuit Diagram
Component Layout Illustrations :-
    Front Panel
    Interior Views
Spares Ordering Schedule
Valve Replacement Data Sheet

Section 1, DESCRIPTION, of this handbook deals with the internal circuits of the Noise Generator and is intended to be read in conjunction with the Functional Diagram; it is strongly recommended that the user should familiarize himself with the principles described in Section 1, and illustrated in the Functional Diagram before commencing the adjustment or replacement of component parts of the instrument.

The Circuit Diagram shows all the electrical components contained in the instrument. The description of these components - their type, value, rating, etc. - is given in the Spares Ordering Schedule; the Schedule also lists certain mechanical components.

The physical location of the elctrical components is shown on the Component Layout Illustrations.

4.2 REPLACEMENT OF VALVES

The types of valves used in the instrument, their base connections, and some guide as to suitable alternatives if the types originally fitted are not readily available, are given in the Valve Replacement Data Sheet.

The valves may normally be replaced without special selection. Valves V1 and V2 are immediately accessible on removing the instrument from its case as described in Section 4.4; to gain access to the noise diode, V3, remove the cover of the noise diode unit in the manner described in Section 4.5.

4.3 WORKING VOLTAGES

Measured with a Model 40 Avometer set to its highest convenient range, the h.t. and l.t. voltages should be of the following order :-

Mains Transformer, T2, h.t. secondary: 260-0-260 V a.c. ±10% overall.
Mains Transformer, T2, l.t. secondary: 6.3 V a.c. ±5%.
H.T. Stabilized, measured across R3: 150 V d.c. ±10%.

With the RANGE switch set to OFF, and the OUTPUT LEVEL control set to maximum (fully clockwise), the voltage across the secondary of the noise-diode filament transformer, T1, should be 4.9 V a.c. ±5%.

4.4 REMOVAL OF CASE

To remove the case, first lay the instrument on its back and extract the eight screws located around the periphery of the front panel. Then, place the instrument on its feet and pull the front panel forward; at the same time, feed the mains lead through the aperture in the side pocket of the case until the instrument is clear of the case.

4.5 REMOVAL OF NOISE-DIODE ASSEMBLY

The cover may be detached by first removing the two valves located at the rear of the unit and then extracting the two screws securing the cover.

In instances where it is necessary to remove the complete unit, unsolder the two leads to the feed-through capacitors situated on the body of the unit, marking the leads in some way so that each lead may later be resoldered to the capacitor from which it was removed. Detach the three instrument-headed screws (annotated 'X' on Component Layout Illustration MP 1106 -1) securing the unit to the front panel, and remove the unit complete with its coaxial output socket.

4.6 SCHEDULE OF TESTS

The following information is based on abstracts from the internal Factory Test Schedule TS 1106 (Series).

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4.6.1 Apparatus Required

(a) 750-volt Insulation Tester.
(b) 0- to 20-mA Milliammeter.
(c) Variable Mains Transformer. For the TF 1106 and TF 1106/1, the transformer output should be continuously variable between 200 and 250 volts; for the TF 1106/2 and TF 1106/3, the transformer output should be continuously variable between 100 and 125 volts. In both cases, input to suit supply mains available.
(d) Wheatstone Bridge.
(e) 0.75-ohm Resistor.

4.6.2 Insulation (Apparatus Required : Item a)

Test the insulation between chassis and each 'live' pin of the supply plug with the SUPPLY switch set to ON. The reading should not be less than 40 MΩ.

4.6.3 Meter Calibration Accuracy (Apparatus Required : Item b)

As described in Section 1.2, the noise factor of a receiver is directly proportional to the noise-diode anode current, hence, by checking the accuracy of the meter circuit, a measure of the accuracy of the instrument is obtained.

Unsolder the two leads connected to contact 7 of the RANGE switch. Keep these two leads connected together. Insert the milliammeter between the leads and contact 7 of the RANGE switch. Check the NOISE FACTOR meter readings against TABLE 1. If the meter calibration is in error, the accuracy of the meter shunts (R9 to R13), or the meter itself, should be checked.

4.6.3 (continued)

TABLE 1

Range Switch Setting	Adjust by means of OUTPUT LEVEL control and set milliammeter to read :-		NOISE FACTOR meter should read
	TF 1106, -/1	TF 1106/2, -/3	
0 - 5	0.70	0.96	1 ±0.3
	1.41	1.92	2 ±0.3
	2.11	2.88	3 ±0.3
	2.82	3.85	4 ±0.3
	3.52	4.80	5 ±0.3
0 - 10	1.41	1.92	2 ±0.6
	2.82	3.85	4 ±0.6
	4.23	5.77	6 ±0.6
	5.63	7.69	8 ±0.6
	7.04	9.62	10 ±0.6
0 - 15	3.52	4.80	5 ±0.9
	7.04	9.62	10 ±0.9
	10.58	14.42	15 ±0.9
0 - 30	7.04	9.62	10 ±1.8
	14.08	19.23	20 ±1.8
	19.72		28 ±1.8

Remove the milliammeter and reconnect the leads

4.6.4 Meter Cross Check Accuracy (Apparatus Required : Item e)

Unsolder the lead connected to contact 1 of the RANGE switch and insert between this lead and the junction of R4 and R5 a resistor of approximately 0.75 ohms.

Set the RANGE switch to 0-5 and adjust the OUTPUT LEVEL control to bring the pointer of the NOISE FACTOR meter to full-scale deflection. Turn the RANGE switch to 0-10 and check that the meter reading falls to 5.

4.6.4 (continued)

Repeat the above procedure, cross-checking the 0-10 range with the 0-15, and the 0-15 range with the 0-30.

The maximum cross-check error should not exceed 10% of the reading.

Remove the 0-75-ohm resistor and return the lead to contact 1 of the switch.

4.6.5 Adjustment of Series Limiting Resistors (Apparatus Required : Item c)

In order to eliminate any dangerous overload on the meter circuit and noise diode, limiting resistors in series with the noise-diode filament supplies are included. To test and, if necessary, adjust the effectiveness of these resistors, the operator should proceed as follows :-

Interpose the variable transformer between the mains supply and the Noise Generator. Adjust the variable-transformer output to be $2\frac{1}{2}\%$ less than the nominal voltage for the internal mains transformer tapping in use, and check that full-scale deflection can be obtained on the 0-5, 0-10, and 0-15 ranges; also check that a noise factor reading of 28, in the case of an instrument having a 71-ohm output, or 20, in the case of an instrument having a 52-ohm output, can be obtained.

Increase the variable-transformer output by 5% and check that a noise factor of 1.5, or less, can be obtained on the 0-5 range.

If these requirements cannot be met, the limiting resistors, R4 to R7, will require adjustment.

4.6.6 Output-Termination Resistor (Apparatus Required : Item d)

Having checked the monitoring arrangements, it only remains to check the value of the output-termination resistor, R8.

With the Noise Generator switched off, connect the Wheatstone Bridge measurement terminals across R8 and measure the value of R8; the resistance should be within ±2% of its nominal value.

4.7 ADDITIONAL TESTS

During the factory calibration of the instrument, tests are made against known noise standards at 45 and 200 Mc/s in order to check the r.f. characteristics of the Noise Generator; also at 200 Mc/s, the Noise Generator is tested to ascertain the effects of any mismatch between the source resistance and the output cable. Due to the inherent simplicity of design of the instrument, it should only be necessary to perform these tests once, i.e., at the factory, and for most normal uses it should not be necessary to repeat them; therefore, if the operator has only a limited range of test equipment at his disposal, these tests may confidently be omitted.

Should the operator wish to carry out these tests, the procedure detailed in Sections 4.7.1 and 4.7.2 should be adopted.

4.7.1 Overall Accuracy at 45 and 200 Mc/s

The method employed in the factory is to compare the instrument under test with a standardized noise generator using a receiver as a transfer standard; alternatively, a receiver with a known noise factor may be used, thus dispensing with the standardized noise generator.

The two methods by which the noise factor may be checked are :

(1) Connect the standardized noise generator to a receiver operating at about 45 Mc/s and measure the noise factor of the receiver. Replace the standardized Noise Generator by the Noise Generator under test and again measure the noise factor. The two values of noise factor should agree to within ±6%.

OR

(2) Connect the Noise Generator under test to a receiver operating at about 45 Mc/s and whose noise factor is known; measure the noise factor. The measured noise factor should be within ±6% of the noise factor quoted for the receiver.

The procedure detailed in (1) or (2) above should be repeated at a frequency as near to the upper limit of the instrument frequency range as is convenient.

4.7.2 Output Cable Mismatch

Tests to ascertain the magnitude of any errors due to a mismatch between any output cable used with the instrument and the source resistance (i.e., the effects of standing waves in the output cable) may be carried out at any frequency within the range 1 to 200 Mc/s; if only one test is to be made, it should be performed at a frequency near to the upper limit of 200 Mc/s where the effects of mismatch will be more apparent. The method of performing this test is detailed below.

(1) Measure the noise factor of the receiver with the Noise Generator under test using the normal output cable.

(2) Replace the Noise-Generator output cable by a cable having an electrical length 1/4-wave length shorter than the normal output cable; at 200 Mc/s, the required reduction in length is approximately 10 inches. Measure the noise factor with this new length of cable.

(3) Replace this cable by one having an electrical length 1/4-wave - length longer than the normal output cable; at 200 Mc/s, the required increase in length is approximately 10 inches. Measure the noise factor with this new length of cable.

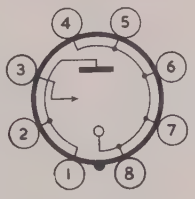
(4) Compare the noise-factor readings obtained in (1), (2), and (3) and check that they agree to within 1.5 dB.

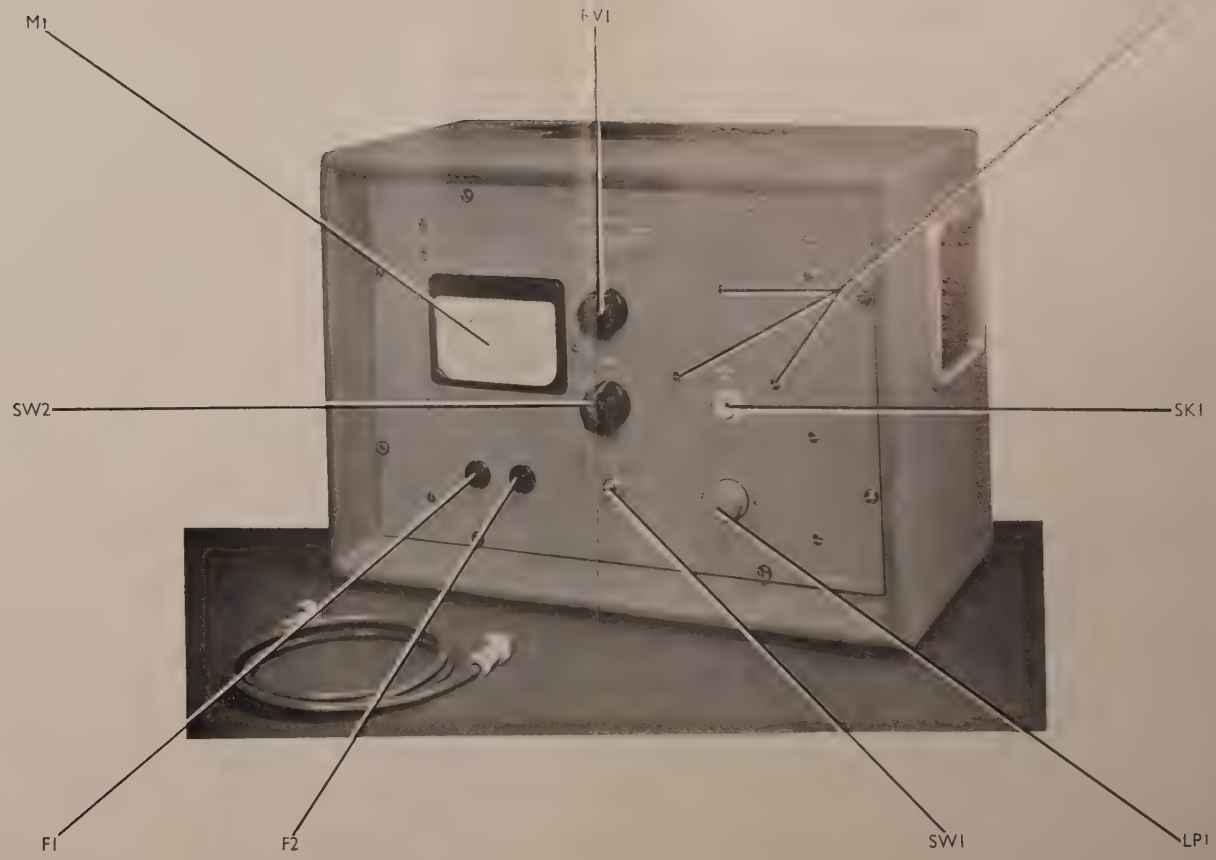
Valve Replacement Data

for

NOISE GENERATOR TYPE TF 1106 (Series)

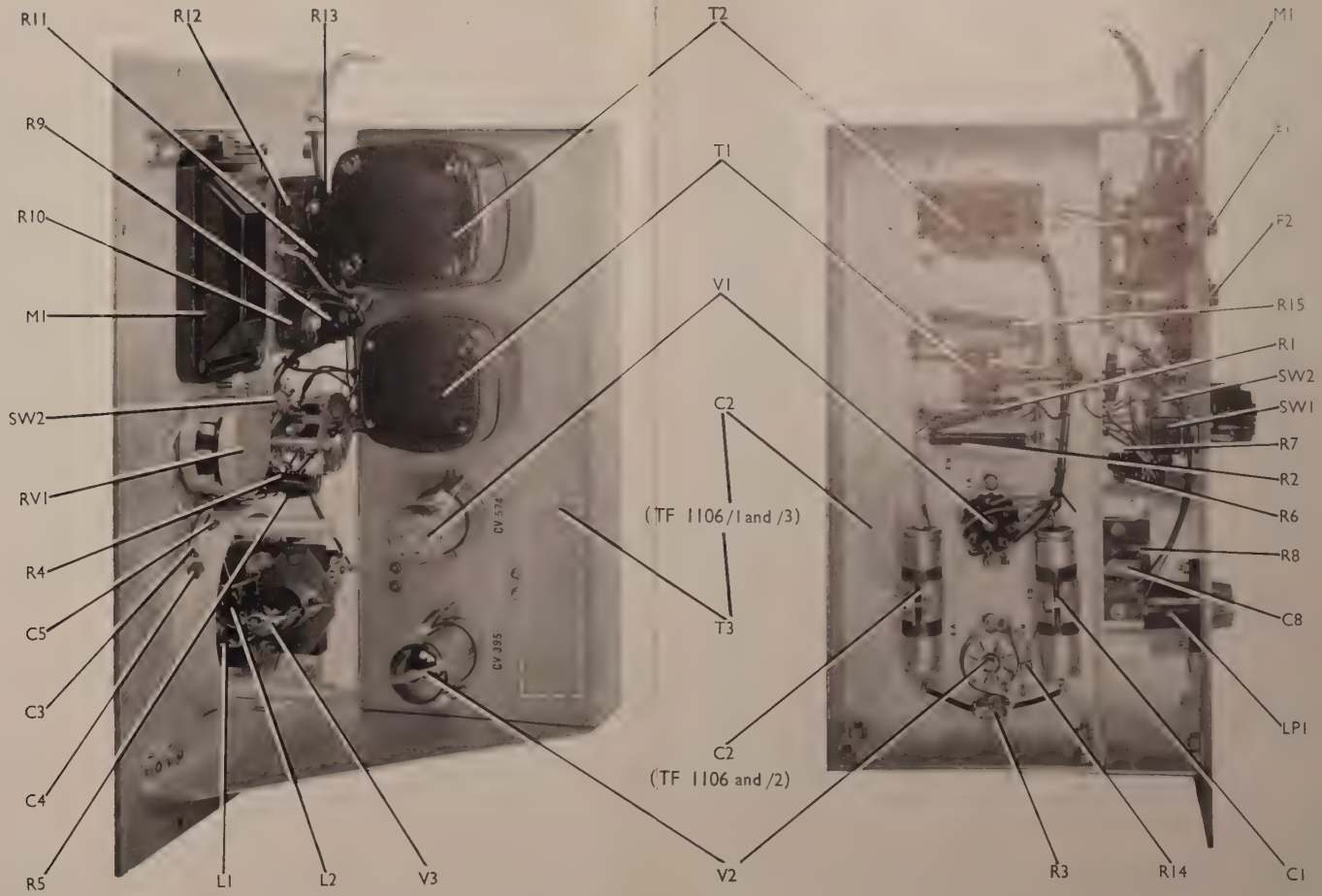
Any valve which becomes faulty should preferably be replaced by a valve of the type originally supplied in the instrument and designated in the following table. If this is not possible, the additional data given by the table may be used as a guide to suitable alternatives.

Valve	*British Commercial Equivalent*	*British Services Equivalent*	*Base*	*U.S. Equivalent*
V1 FULL-WAVE RECTIFIER BRIMAR 6X5GT	EZ35 U70	CV574	INTERNATIONAL OCTAL	6X5GT
V2 VOLTAGE STABILIZER MARCONI QS150/45		CV395	LOCTAL (B8G) 	
V3 NOISE DIODE MARCONI A2087		CV2171	MINIATURE 7-PIN (B7G)	



FRONT PANEL

M.I. LTD. TF 1106(SERIES) 2—6/60
C.P. 1.25c. 4/65



NOTE
R17, when fitted, is located between T2 and R15.

CHASSIS
TOP AND UNDERSIDE

SOS Item No.	Circuit Ref.	Description	Works Ref.
		LAMP AND LAMPHOLDER	
41	LP1	6.5-volt, 2.36-watt Pilot Lamp.	33-TF 1106
42		Holder for LP1	13-TF 1106
43		Translucent Cover for Item 42.	32-TF 1106
		FUSES AND FUSE HOLDERS	
44	F1	1 amp, Glass Cartridge.	54-TF 1106
45	F2	1 amp, Glass Cartridge.	54-TF 1106
46		Holder for F1 and F2.	53-TF 1106
		PLUGS, SOCKETS & CONNECTING LEADS	
47		Mains Lead comprising 6-ft flexible cable and 3-pin plug. (TF 1106 and TF 1106/2 only).	TM2560AQ
48		Mains Lead comprising 6-ft flexible cable and 2-pin plug. (TF 1106/1 and TF 1106/3 only).	TM2560AX
49		Rubber entry sleeve for Items 47 or 48.	49-TF 1106
50		Coaxial output lead complete with two plugs; characteristic impedance 71 ohms. (TF 1106 and TF 1106/1 only).	TM4726/6
51		Coaxial output lead complete with two plugs; characteristic impedance 52 ohms. (TF 1106/2 and TF 1106/3 only).	TM4726/11

SOS Item No.	Circuit Ref.	Description	Works Ref.
		CAPACITORS (continued)	
25	C7	Mica, 0.001 µF ±10%, 350 V d.c.	10-TR/C751232
26	C8	Paper, 0.01 µF ±10%, 350 V d.c.	11-TR/C751232
		TRANSFORMERS & INDUCTORS	
27	T1	Main h.t. transformer.	TR/D751226
28	T2	Noise diode filament transformer.	TR/D751227
29	T3	100-125 V/240 V auto-transformer. (Fitted on TF 1106/1 and TF 1106/3 only)	TM4661
30	L1	L.T. Filter Inductor.	TR/A751240
31	L2	L.T. Filter Inductor.	TR/A751240
		VALVES, VALVEHOLDERS & RETAINERS	
32	V1	6X5GT, Full-Wave Rectifier.	15-TF 1106
33		Holder for V1.	39-TF 1106
34		Retainer for V1.	40-TF 1106
35	V2	QS150/45, Voltage Stabilizer.	16-TF 1106
36		Holder for V2.	TR/A751768
37		Retainer for V2.	41-TF 1106
38	V3	A2087, Noise Diode.	19-TR/C751232
39		Holder for V3.	13-TR/C751232
40		Retainer for V3.	14-TR/C751232

SOS Item No.	Circuit Ref.	Description	Works Ref.
		RESISTORS (continued)	
8	R7	Carbon, High Stability, 71 Ω ±2%, 1/8W (TF 1106 and TF 1106/1 only)	TR/A751251
9	R8	Carbon, High Stability, 52 Ω ±2%, 1/8W (TF 1106/2 and TF 1106/3 only)	12-TR/C751232/1
10	R9	Wire-Wound, 28 Ω ±0.5%	24-TF 1106
11	R10	Wire-Wound, 28 Ω ±0.5%	24-TF 1106
12	R11	Wire-Wound, 28 Ω ±0.5%	24-TF 1106
13	R12	Wire-Wound, 84 Ω ±0.5%	25-TF 1106
14	R13	Wire-Wound, 383 Ω ±0.5%	26-TF 1106
15	R14	Composition, 82 kΩ ±5% $\frac{1}{2}$W	18-TF 1106
16	R15	Wire-Wound, 30 kΩ ±5%, 12W	21-TF 1106
17	R16	Carbon, High-Stability, 110 Ω ±2% $\frac{1}{2}$W (Fitted on TF 1106/2 and TF 1106/3 only)	73-TF 1106/2
17/1	R17	Composition, 10 Ω ±10%, $\frac{1}{2}$W	77-TF 1106
18	RV1	Wire-Wound, Variable, 2.5 kΩ ±10%, 2.5W	TR/A751233
		CAPACITORS	
19	C1	Electrolytic, 8 µF -20% +50%, 350 V d.c.	17-TF 1106
20	C2	Electrolytic, 8 µF -20% +50%, 350 V d.c.	17-TF 1106
21	C3	Ceramic, 560 µµF ±20%, 350 V d.c.	TR/A751249
22	C4	Ceramic, 500 µµF ±20%, 350 V d.c.	TR/A751250/1
23	C5	Ceramic, 500 µµF ±20%, 350 V d.c.	TR/A751250/1
24	C6	Mica, 0.001 µF ±10%, 350 V d.c.	10-TR/C751232

SPARES ORDERING SCHEDULE NO. SOS/1106 (Series)

WITH CIRCUIT REFERENCES

for

NOISE GENERATOR

TYPES TF 1106, TF 1106/1, TF 1106/2, AND TF 1106/3

Applicable to Instruments Serial Nos :-

195201 to 195250
503701 to 503750
JA 118/01 to JA 118/50
JA 368/001 to JA 368/100
52002/001 to 52002/100
5092001 to 5092100
JA 47/01 to JA 47/50
52126/001 to 52126/100
52267/001 to 52267/100

When ordering replacement parts, please state: the quantity and type required, the number and issue of the Spares Ordering Schedule, and the SOS item number of the part required.

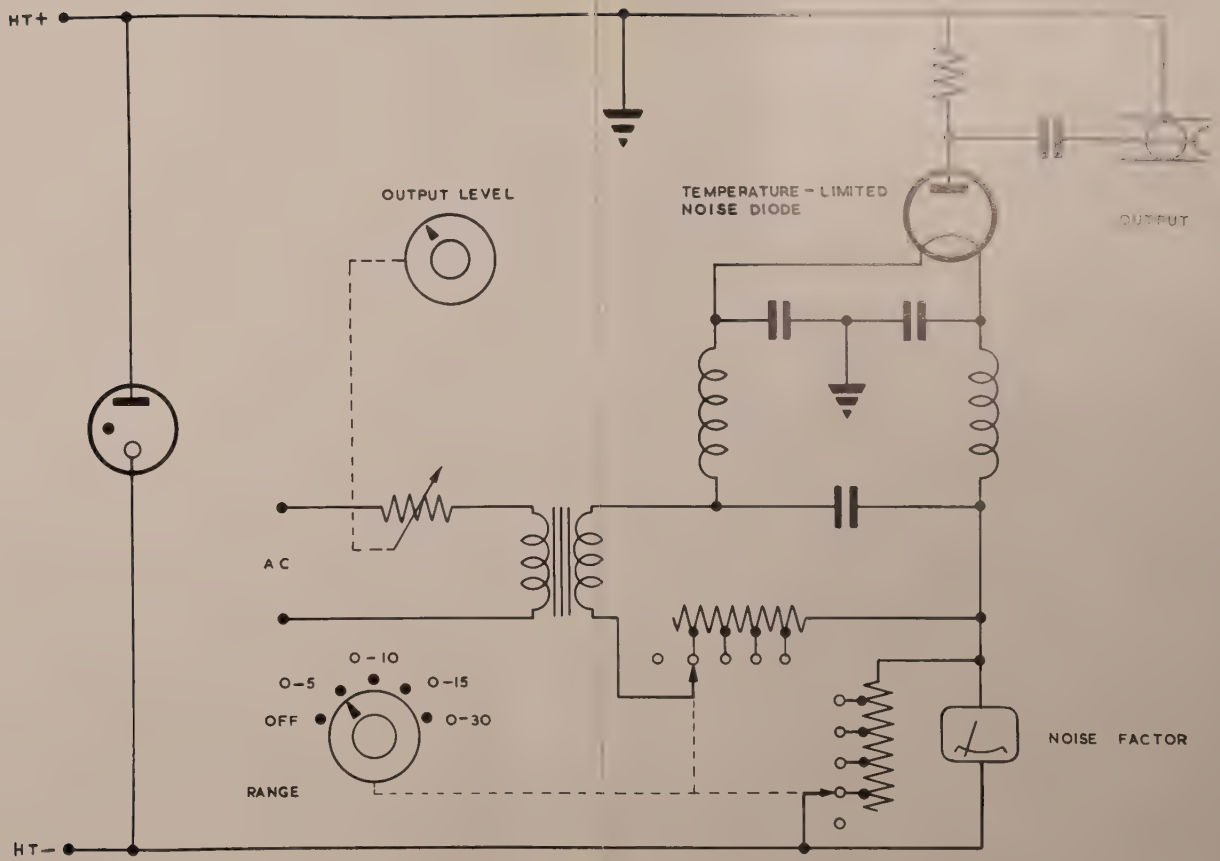
For example, to order a replacement for the 220-kΩ, 1/4-W resistor, R3, quote :

1off, Resistor, SOS/1106 (Series), Item 3

SOS Item No.	Circuit Ref.	Description	Works Ref.
1	R1	Wire-Wound, 2.2 kΩ ±5%, 12 W	19-TF 1106
2	R2	Wire-Wound, 1.8 kΩ. ±5%, 12W.	20-TF 1106
3	R3	Composition, 220 kΩ ±10%, 1/4W.	22-TF 1106
4	R4	Wire-Wound, Special, 1.99Ω*	TR/A751238
5	R5	Wire-Wound, Special, 1.49Ω*	TR/A751238/1
6	R6	Wire-Wound, Special, 1.06Ω*	TR/A751238/2
7	R7	Wire-Wound, Special, 0.32Ω*	TR/A751238/3

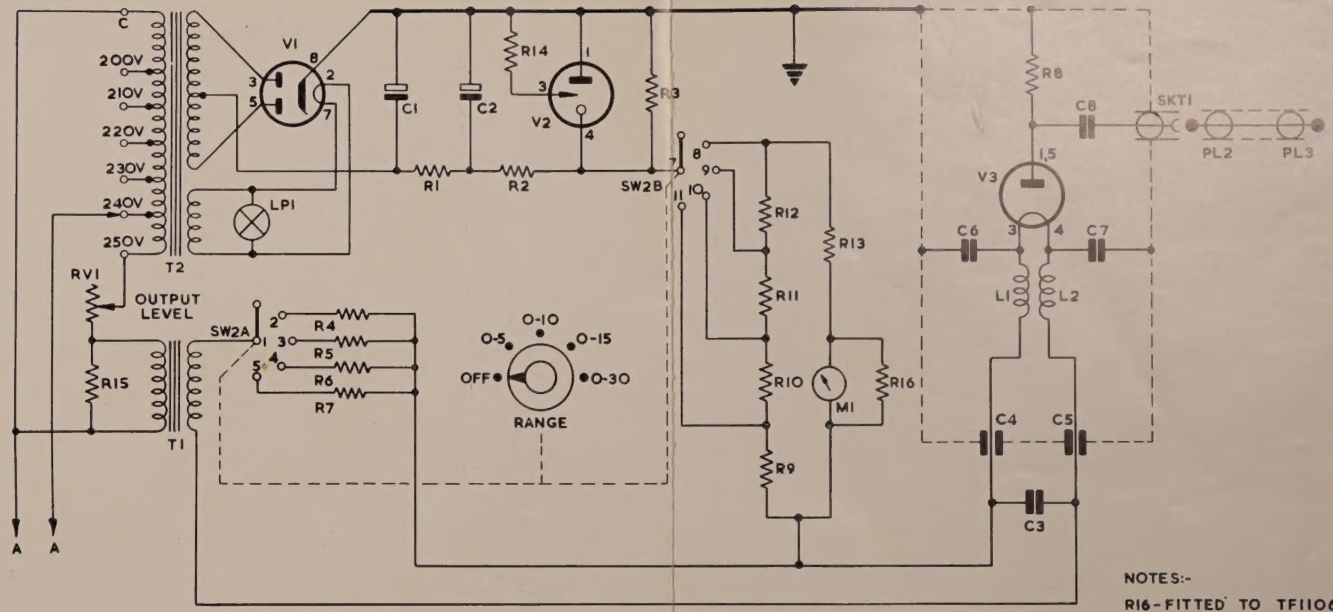
*Nominal value; actual value determined during calibration.

SOS Item No.	Circuit Ref.	Description	Works Ref.
		MISCELLANEOUS	
52		Knob, for OUTPUT LEVEL and RANGE controls.	35/37-TF 1106
53		Complete case assembly comprising Items 54 to 57 inclusive.	
54		Case; included in Item 53.	TM4309/1
55		Carrying Handle; included in Item 53.	TC18996/3
56		Side pocket escutcheons, set of two; included in Item 53.	TB18258/2
57		Case feet, set of four; included in Item 53.	TA11420
58		Front Panel.	TD23793
59		Cover for Noise Diode Assembly.	TR/B751244
60		Operating and Maintenance Handbook.	OM 1106 (Series)



FUNCTIONAL DIAGRAM

M.I. LTD. TF 1106(SERIES) 2—6/60
C.P. 1.25c. 4/65



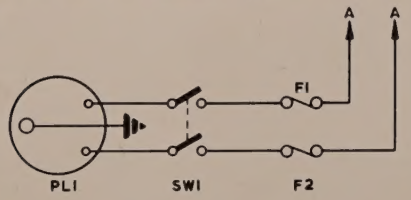
NOTES:-

R16 - FITTED TO TF1106/2 AND TF1106/3 ONLY

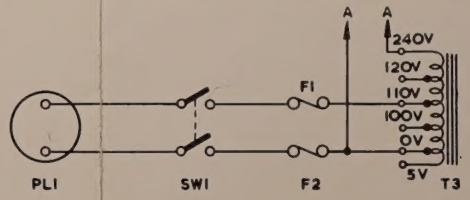
V2 - NO CONNECTIONS TO BE MADE TO PINS 2,5,6,7. OR 8.

V3 - NO CONNECTIONS TO BE MADE TO PINS 2,6,OR 7.

200 TO 250 VOLT MODELS (TF1106 AND TF1106/2).



100 TO 125 VOLT MODELS (TF1106/1 AND TF1106/3).



CIRCUIT DIAGRAM

M.I. LTD. TF1106(SERIES) 3—6/60 (FROM TC23794 ISSUE4
C.P. 1.25c. 4/65